CLAIMS:

1. A method for determining instantaneous leak flow at a mask having a leak path during mechanical ventilation, the method comprising the steps of:

(a) determining instantaneous airflow at the mask;

(b) determining instantaneous pressure at the mask;

(c) estimating non-linear conductance of said leak path as the low-pass filtered instantaneous airflow divided by the low-pass filtered square root of the instantaneous pressure; and

(d) determining said instantaneous leak flow to be said conductance multiplied by the square root of the said instantaneous pressure.

2. A method for determining instantaneous respiratory airflow for a subject receiving breathable gas by a mask and in the presence of any mask leak, the method comprising the steps of:

(a) determining instantaneous airflow at the mask;

(b) determining instantaneous pressure at the mask;

(c) estimating non-linear conductance of said leak path as the low pass filtered instantaneous airflow divided by the low pass filtered square root of the instantaneous pressure;

(d) determining instantaneous leak flow to be said conductance multiplied by the square root of the said instantaneous pressure; and

(e) calculating the respiratory airflow as the instantaneous airflow minus the instantaneous leak flow.

3. A method as claimed in claim 2, whereby the time constants for said low pass filtering are dynamically adjustable dependent upon sudden changes in said instantaneous leak flow.

4. A method as claimed in claim 3, whereby said dynamic adjustment comprises the further steps of:

deriving an index of the extent to which said conductance has changed suddenly; and

changing said time constants in an opposite sense to a corresponding change in said index.

5. A method as claimed in claim 4, whereby said index is derived by the steps of:

from said calculated respiratory airflow, determining the extent to which the absolute magnitude of calculated airflow is larger than expected for longer than expected.

6. A method as claimed in claim 2. whereby steps (a) and (b) comprise:

measuring airflow and pressure in a gas delivery circuit coupled to said mask;

calculating the pressure drop along the delivery circuit to the mask as a function of said delivery circuit airflow; and

calculating a derived said instantaneous mask pressure as the measured delivery circuit pressure less the pressure drop; and

calculating the airflow through an exhaust of the mask as a function of the derived instantaneous mask pressure; and

calculating a derived said mask airflow as the measured delivery circuit airflow minus the exhaust airflow.

7. Apparatus for determining respiratory airflow for a subject receiving breathable gas by a mask and in the presence of any mask leak, the apparatus comprising:

transducer means located at or proximate the mask to determine instantaneous mask airflow and pressure; and

processing means for estimating non-linear conductance of said leak path as the low pass filtered instantaneous airflow divided by the low pass filtered square root of the instantaneous pressure, determining instantaneous leak flow to be said conductance multiplied by the square root of the said instantaneous pressure, and calculating the respiratory airflow as the instantaneous airflow minus the instantaneous leak flow.

8. Apparatus as claimed in claim 7, wherein the time constants for said low pass filtering are dynamically adjustable dependent upon sudden changes in said instantaneous leak flow.

9. Apparatus as claimed in claim 8, wherein said processor means dynamically adjusts the time constants by deriving an index of the extent to which said conductance has changed suddenly, and changing said time constants in an opposite sense to a corresponding change in said index.

10. Apparatus as claimed in claim 9, wherein said processor means derives said index from said calculated respiratory airflow by determining the extent to which the absolute magnitude of calculated airflow is larger than expected for longer than expected.

11. Apparatus as claimed in claim 7, wherein said transducer means comprises a pneumotachograph coupled to a differential pressure transducer.

12. Apparatus as claimed in claim 11, wherein said pneumotachograph is located between the mask and the mask exhaust.

13. Apparatus as claimed in claim 11, wherein said transducer means is located in a gas delivery circuit connected with said mask and remote from said mask.

14. Apparatus for providing continuous positive airway pressure treatment or mechanical ventilation, the apparatus comprising:

a turbine for the generation of a supply of breathable gas;

a gas delivery tube having connection with the turbine;

a mask having connection to the delivery tube to supply said breathable gas to a subject's airway;

transducer means located at or proximate the mask to determine instantaneous mask airflow and pressure;

processor means for estimating non-linear conductance of said leak path as the low pass filtered instantaneous airflow divided by the low pass filtered square root of the instantaneous pressure, determining instantaneous leak flow to be said conductance multiplied by the square root of the said instantaneous pressure, and calculating the respiratory airflow as the instantaneous airflow minus the instantaneous leak flow; and

control means to control the flow generator to, in turn, control the mask pressure and/or mask airflow on the basis of the calculated respiratory airflow.

15. Apparatus as claimed in claim 14, wherein the time constants for said low pass filtering are dynamically adjustable dependent upon sudden changes in said instantaneous leak flow.

16. Apparatus as claimed in claim 15, wherein said processor means dynamically adjusts the time constants by deriving an index of the extent to which said conductance has changed suddenly, and changes said time constants in an opposite sense to a corresponding change in said index.

17. Apparatus as claimed in claim 16, wherein said processor means derives said index from said calculated respiratory airflow by determining the extent to which the absolute magnitude of calculated airflow is larger than expected for longer than expected.

18. A computer program for determining instantaneous respiratory airflow for a subject receiving breathable gas by a mask and in the presence of any mask leak, the program receiving input data of instantaneous airflow and pressure at the mask, and comprising the computational steps of:

(a) determining instantaneous airflow at the mask;

(b) determining instantaneous pressure at the mask;

(c) estimating non-linear conductance of said leak path as the low pass filtered instantaneous airflow divided by the low pass filtered square root of the instantaneous pressure;

(d) determining instantaneous leak flow to be said conductance multiplied by the square root of the said instantaneous pressure; and

(e) calculating the respiratory airflow as the instantaneous airflow minus the instantaneous leak flow.